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## PATENT SPECIFICATION



Application Date: Feb. 11, 1939. No. 4527/39.

525,010

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Complete Specification Accepted: Aug. 20, 1940.

### PROVISIONAL SPECIFICATION

#### Improvements in or relating to Expanding Pads for use in Lathe Tool Holders or for other purposes

We, RICHARD GARRETT ENGINEERING WORKS LIMITED, British Company, of Leiston Works, Leiston, in the County of Suffolk, and LESLIE WILLIAM FARROW, of 59, Central Road, Leiston, and ERNEST WILLIAM CUTHERBERT, of 102, King George's Avenue, Leiston, both in the County of Suffolk, and British Subjects, do hereby declare the nature of this invention to be as follows:—

This invention relates to expanding pads of the type in which wedges and the like are used to increase the thickness of the pad for the purpose of securing objects in position or moving them from one position to another, and has for its object an improved means whereby the expansion of a pad may be accomplished without the use of wedges and the like, and has particular but not exclusive application to the holding of cutting or turning tools in machine tool holders.

Previously it has been the custom in certain cases where powerful pressure is required, to hold objects in position or to move objects from one position to another, to employ devices fitted with wedges or screws which may have disadvantages in that there may be considerable loss due to friction, and particularly in the case of screws which may necessitate multiple points of operation to obtain the desired uniform pressure over a specified area, thus resulting in considerable loss of time in their operation.

Now according to our invention, we may employ a length of roller chain or the like arranged in a zigzag fashion between a top and bottom plate, in such a manner that the bottom rollers of the zigzag chain are in contact with the top of the bottom plate and the top rollers of the zigzag chain are in contact with the under surface of the top plate. A block is placed at each end of the zigzag chain and between the bottom and top plate and a clamping bolt passes through one block and is screwed into the other block, the clamping bolt being arranged in such a manner that it lies longitudinally between the top and bottom plate and parallel thereto.

[Price 1/-]

On applying rotary motion in the desired direction to the clamping bolt, the blocks will be drawn together, thus contracting the angle between the links of the zigzag roller chain or the like which in turn will cause the top and bottom rollers of the zigzag chain or the like to press against the corresponding top and bottom plates and thrust them apart, the chain links or the like acting on the known principle of the toggle.

In carrying our invention into effect according to one convenient method of construction, we may use two inverted T shaped metal strips of suitable section and length placed horizontally side by side at a suitable distance apart, and parallel to each other and across and above each end of these strips is placed a rectangular shaped block of a length equal to the overall width over the strips, the underside of these blocks being cut away local to each strip in such a manner that a step is formed which fits down and between the inner faces of the strips. One of these blocks may be provided with a centrally placed hole parallel with the strips, this hole being counter bored to a larger diameter, the face of the counter bore being spherically concave, the other block having a similarly placed hole which is screwed, both of these holes being of suitable diameter to receive a clamping bolt which may be of a length approximately equal to the strips, and has provided at one end a head of suitable design to receive a spanner, the under side of this head being made spherically convex to fit in the concave counter bore of the block previously described, and the other end of the clamping bolt being screwed to suit the screwed block, this clamping bolt being passed through the block having a clear hole, and screwed into the block at the other end of the inverted T shaped strips. Between the inner faces of the end blocks, and on each side of the clamping bolt and parallel thereto we may insert a suitable length of roller chain or the like vertically arranged in a zigzag form; the lower rollers of the chain or the like resting on

the legs of the inverted T shaped strips; these legs providing the necessary guide to the lower rollers of the zig-zagged chain or the like.

5 When the links of the chain are zig-zagged and in such a position as to form an included angle of approximately 90° to each other, the top surface of the upper rollers of the chain or the like will be

10 approximately level and in the same plane as the top surface of the end blocks. Laid squarely on and approximately equal in length and width to the assembly previously described in a rectangular pad of

15 suitable section, which has formed on its underside two raised strips which run lengthwise along the plate and having a width equal to that of the legs of the inverted T shaped strips with which they

20 are laterally in line, these two raised strips forming the necessary guide for the upper rollers of the zig-zagged chain.

The assembled unit thus described may be held together by two headed pins which

25 fit in two vertical holes, one on either side of the clamping bolt, these pins being positioned in such a way as to pass through the top rectangular pad, the screwed block, and the inverted T shaped

30 strips. The holes to receive these pins are counterbored on the top surface of the rectangular shaped pad to receive the head of the pin, and on the underside of the inverted T shaped strips to receive a

35 collar which may be riveted to the pin. The depth of these counterbores is such that the head and collar of the pin are slightly below the surface of the rectangular shaped pad and inverted T shaped

40 strip, and also allow a suitable vertical movement of the top rectangular pad.

The complete assembly thus takes the form of a rectangular shaped pad or block, all the surfaces of which are flat

45 and parallel to each other, and is operated by a rotary motion being imparted to the clamping bolt by means of a spanner or the like in such a manner that it draws the end blocks together, causing

50 the rollers of the chain or the like to approach each other in a lengthwise direction; and since the upper and lower rollers are anchored to each other at a convenient distance due to the links of

55 the chain or the like and contract in a lengthwise direction will cause the top rollers of the chain to rise in a vertical direction and at the same time reduce the included angle between the links. The

60 top rollers being in contact with the under side of the top rectangular pad will therefore raise this pad a corresponding amount and increase or expand the thickness of the assembled pad by the

65 same amount.

A feature of this invention is that by imparting rotary motion with a minimum of effort to the clamping bolt, the pad will expand in the manner previously described and will exert a powerful 70 pressure in the desired direction over a specified area for the purpose of moving or securing objects in position.

A further feature is that the pad, being operated from a single point, requires a 75 minimum of time only in operation thereof.

Such characteristics are of the utmost use, but not exclusive to cases where the pad is placed in rectangular slots into which the tool or object to be held is also placed in such a manner that on operating the clamping bolt to expand the pad already described, a powerful tightening or gripping effect is given to the object to be held.

We do not confine the ambit of our invention to the shape of the pad, the expanding of the pad in one direction only, the number of chains we may use, or to the use of roller chains only, as in an 90 alternative construction we may employ any number of chains which may be arranged in a radial manner round a central clamping bolt for the purpose of giving expansion in one or more directions. 95

We may also use in place of the chain a series of balls or rollers, which may be arranged in a zig-zag form preferably in two or more longitudinal rows one above the other and working in guideways 100 formed on the top and bottom plates.

In another construction we may substitute for the chain, a series of loose levers or bars each having their ends preferably rounded, arranged and guided in 105 a similar manner to the chain.

In a modified form of assembly, the clamping bolt may be replaced by a compressed air, hydraulic, or electrically operated clamping device, and the inverted T shaped strips substituted for a single plate of the same formation as for the top rectangular shaped pad.

A further application of this invention may consist of a series of these expanding 115 pads placed at convenient distances apart, the screws of which may preferably be worked by differential gearing in such a manner that a balanced lift or grip or other movement be given to the object 120 resting on these pads.

Dated this thirteenth day of December, 1938.

For RICHARD GARRETT  
ENGINEERING WORKS LIMITED.

A. BAMROUGH,  
Manager & Secretary of Richard Garrett  
Engineering Works Limited.

L. W. FARROW.  
E. W. CUTTHBERT.

## COMPLETE SPECIFICATION

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Tool Holders or for other purposes

We, RICHARD GARRETT ENGINEERING WORKS LIMITED, a British Company, of Leiston Works, Leiston, in the County of Suffolk, and LESLIE WILLIAM FARROW, 5 of 59, Central Road, Leiston, and ERNEST WILLIAM CUTTHBERT, of 102, King George's Avenue, Leiston, both in the County of Suffolk and both British Subjects, do hereby declare the nature of this 10 invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to expanding 15 pads or blocks for use particularly but not exclusively, in holding a cutting or turning tool in machine tool holders and is concerned particularly with that type of expanding pad or block in which 20 wedges and the like are normally used to increase the thickness of the pad or block for the purpose of securing the tool or other objects in position or moving them from one position to another, and has for 25 its object an improved means whereby the expansion of a pad or block may be accomplished without the use of wedges and the like.

Previously it has been the custom in 30 certain cases where powerful pressure is required, to hold objects in position or to move objects from one position to another, to employ devices fitted with wedges or screws but such devices have 35 disadvantages in that there may be considerable loss of power due to friction, particularly in the case of screws which may necessitate multiple points of operation to obtain the desired uniform pressure 40 over a specified area, thus resulting in considerable loss of time in their operation.

According to the present invention the 45 expanding pad or block comprises a plurality of elements of elongated shape arranged end to end in zig-zag fashion between members movable towards or away from each other to reduce or increase the angle between said elements and thereby 50 increase or reduce the depth or thickness of said pad or block.

According to one particular embodiment of the invention the elongated elements are formed into a length or 55 lengths of chain, arranged in zig-zag form and located between two members movable towards and away from each other to reduce or increase the angle between the links of said chain and thereby increase

or reduce the thickness of the pad or 60 block, and in order that the invention may be more clearly understood an example of this latter form of construction as applied to machine tool holders, will now be described with reference to the 65 accompanying drawings, wherein:—

Figure 1 is a section on the line 1—1 of Figure 2,

Figure 2 is a section on the line 2—2 of Figure 1,

Figure 3 is an end elevation looking in 70 the direction of the arrow 3 in Figure 1, and

Figure 4 is a transverse section on the line 4—4 of Figure 1.

Referring to these drawings the expanding pad or block, for holding a machine tool assembly 5 in position in its holder, comprises generally, two lengths of roller chain 6 and 7 arranged in zig-zag fashion so that the rollers 8 and 9 80 are in the upper and lower rows respectively are in staggered relationship. The two lengths of chain 6 and 7 are located between an upper plate 10 and lower strips 85 or rails 11 and 12 in such a manner that the rollers 8 in the upper rows are in contact with the under surface of the upper plate 10, and the rollers 9 in the lower rows are in contact with the upper surface 90 of the strips or rails 11 and 12. At each end of the lengths of chain 6 and 7 and between the plate 10 and strips or rails 11 and 12, are two blocks 13 and 14 95 which are connected together by a connecting bolt 15 which passes freely through the block 13 and is screwed into the other block 14, said clamping bolt being arranged in such a manner that it lies longitudinally between the upper 100 plate 10 and the rails 11, 12 and between the two lengths of chain 6 and 7 and parallel thereto. The block 14, into which the bolt 15 is screwed, is held 105 against lengthwise movement between the plate 10 and the rails 11 and 12 by pins 25 but the block 13, through which the bolt 15 passes freely, is arranged to slide lengthwise between said plate 10 and rails 11 and 12, so that upon applying 110

rotary motion in the desired direction to the bolt 15, the block 13 will be drawn towards the block 14 in a lengthwise direction, thereby contracting the angle between the links of the chains 6 and 7 115 which in turn will cause the top and bottom rollers 8 and 9 to press against the top plate 10 and the rails 11 and 12

and thrust them apart to increase the thickness of the pad or block, the chain links acting on the known principle of the toggle.

5 The two strips or rails 11 and 12 are inverted T-shape in cross-section so as to provide recesses 16 into which the ends of the links of the chains 6 and 7 can pass, and said strips or rails are arranged horizontally side by side at a suitable distance apart and parallel to each other and across and above each end of these strips or rails is placed the blocks 13 and 14 which have a length equal to the overall width over the strips, the under-side of each of said blocks being cut away locally to each strip in such a manner that a step 17 is formed which fits down and between the inner faces of the strips or rails 11 and 12.

10 The hole provided in the block 13, for the passage of the clamping bolt 15, is arranged centrally of the block and parallel with the rails 11 and 12 and is counter bored to a larger diameter, the face of the counter bore being of substantially truncated conical form. The hole in the other block 14 is similarly placed and is screw threaded to receive the screw threaded end of the clamping bolt 15 which is provided at its opposite end with a head 18 having a hexagon recess 19 for the reception of a spanner and a truncated conical shoulder to fit 15 the correspondingly shaped bore in the block 13. When the bolt 15 is rotated in a direction to reduce the angle between the links and thereby cause the pad to be expanded as described above, the block 13 is caused to move in a direction towards the block 14 by the head 18 of the bolt and to ensure that the said block will move in a direction away from the block 14 to cause the pad to contract when the bolt is rotated in the opposite direction, a collar 22 is mounted on the shank of the bolt 15 adjacent the inner surface of the block 13, said collar being secured in position by grub screws 23.

15 The roller chains 6 and 7 are located between the inner faces of the blocks 13 and 14 and on each side of the clamping bolt 15; the lower rollers 9 of each chain rest on the legs of the inverted T-shaped rails 11 and 12 which have a width substantially equal to the width of the rollers of the chains, these legs providing the necessary guide to the said rollers, and the upper rollers 8 rest against raised strips 20 formed lengthwise on the under-side of the plate 10 and having a width equal to the legs of the inverted T-shaped strips with which they are laterally in line, these two raised strips forming the 20 necessary guides for the rollers 8 of the

chains.

In order to reduce friction during operation the inner surfaces of the blocks 13 and 14 against which the ends of the chains 6 and 7 abut are provided with raised portions 24 having a width substantially equal to the width of the rollers of the chains, so that the links of said chains extend on each side of said raised portions.

The assembled unit constructed as above described is held together by two-headed pins 25 arranged one on either side of the clamping bolt 15 and passing through the top plate 10, the block 14 and the strips or rails 11, 12. The holes which receive these pins 25 are counter bored on the top surface of the plate 10 to receive the head on one end of the pin and on the under side of the strips or rails 11, 12 to receive the head on the other end of the pin. The depth of these counter bores is such that the heads of the pins are slightly below the surface of the plate 10 and the strips or rails 11, 12 and also allow a suitable vertical movement of the top plate 10. The complete assembly thus takes the form of a rectangular shaped pad or block, all the surfaces of which are flat and parallel to each other, and said assembly is secured in position in the tool holder by a screw 26 or the like.

A great advantage of the device according to the invention is that by imparting rotary motion with a minimum of effort to the clamping bolt 15, the pad or block will expand in the manner previously described and will exert a powerful pressure in the desired direction evenly over a specified area for the purpose of securing the tool in position.

A further advantage is that the pad or block, being operated from a single point, requires a minimum of time only in operation thereof.

Such characteristics are of the utmost use, but not exclusive to cases where the pad or block is placed in rectangular slots into which the tool or object to be held is also placed in such a manner that on operating the clamping bolt to expand the pad, already described, a powerful tightening or gripping effect is given to the object to be held.

We do not confine the ambit of our invention to the particular embodiment described either as regards the shape of the pad, the expanding of the pad in one direction only, the number of chains we may use, or to the use of roller chains only, as in an alternative construction we may employ any number of chains which may be arranged in a radial manner around a central clamping bolt for the

purpose of giving expansion in one or more directions.

In another construction we may substitute for the chain, a series of loose or disconnected levers or bars each having their ends preferably rounded, arranged and guided in a similar manner to the chain.

In a modified form of assembly, the 10 clamping bolt may be replaced by a compressed air, hydraulic or electrically operated clamping device, and the strips 11, 12 substituted for a single plate of the same form as for the top rectangular plate 10.

A further application of this invention may consist of a series of these expanding pads placed at convenient distances apart, the clamping bolts of which may preferably be worked by differential gearing in such a manner that a balanced lift or grip or other movement be given to the object resting on these pads.

Having now particularly described and 25 ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An expanding pad or block, for use 30 in clamping a tool in machine tool holders or for like purposes, comprising a plurality of elements of elongated shape arranged end to end in zig-zag fashion between members movable towards or 35 away from each other to reduce or increase the angle between said elements and thereby increase or reduce the depth or thickness of said pad or block.

2. An expanding pad or block, for use 40 in clamping a tool in machine tool holders or for like purposes, comprising elements forming a length or lengths of chain arranged in zig-zag fashion and confined between two members movable 45 towards or away from each other to reduce or increase the angle between the links of said chain and thereby increase or reduce the thickness of the pad or block.

3. An expanding pad or block accord- 50 ing to any of claims 1 or 2, wherein the elements arranged in zig-zag fashion are arranged in horizontal rows between two members connected together by means capable of moving said members towards 55 and away from each other, and said elements are guided above and below by horizontally disposed guide means.

4. An expanding pad or block accord- 60 ing to claim 2 or 3, wherein two roller chains are arranged between two blocks movable towards and away from each other by a connecting bolt disposed between said chains and guide means for said chains are disposed on each side 65 thereof parallel with the connecting bolt.

5. An expanding pad or block accord- 70 ing to claim 3 or 4, wherein said guide means comprise a plate on one side of said elements or chains and two strips or rails on the opposite side thereof.

6. An expanding pad or block accord- 75 ing to claim 5, wherein the guide plate is provided with raised strips so disposed as to form guides or rails for the rollers of the chains or other elements and the guide rails are of inverted substantially T-shaped cross-section and so disposed that the legs of the T form guides for the rollers of the chains or other elements.

7. An expanding pad or block accord- 80 ing to claim 4, 5 or 6, wherein one of said blocks is provided with a central hole through which the connecting bolt passes freely and which is counterbored to receive the head of said connecting bolt, and the other block is provided with a similarly disposed screw threaded hole for receiving the opposite end of the connecting bolt which is correspondingly screw threaded.

8. An expanding pad or block accord- 85 ing to any of claims 4 to 7, wherein the parts of the inner faces of the blocks against which the ends of the chain or rows of other elements abut are provided with raised portions as and for the purpose specified.

9. An expanding pad or block accord- 95 ing to any of claims 4 to 8, wherein the head of the connecting bolt is provided with a recess for the reception of a spanner and on the shank of said bolt a collar is mounted adjacent the inner face of the counterbored block as and for the purpose specified.

10. An expanding pad or block accord- 100 ing to claims 4 to 9, wherein the assembly comprising the chains, clamping means and guide means are connected together by pins arranged one on each side of the 110 clamping bolt and passing through the guide plate, screw threaded block and the guide rails or strips.

11. An expanding pad or block accord- 115 ing to claim 10, wherein the connecting pins are two-headed and the holes for the reception of said pins are counterbored on the outer surface of the guide plate and guide rails or strips to receive the heads of the pins, said counterbores having a 120 depth such that the heads of the pins are below the surface of the guide plate and guide rails or strips and such as to allow relative movement of the guide plate and guide rails away from each other.

12. An expanding pad or block accord- 125 ing to any of the preceding claims wherein said pad or block is held in the tool holder or the like by a screw.

13. An expanding pad or block, for 130

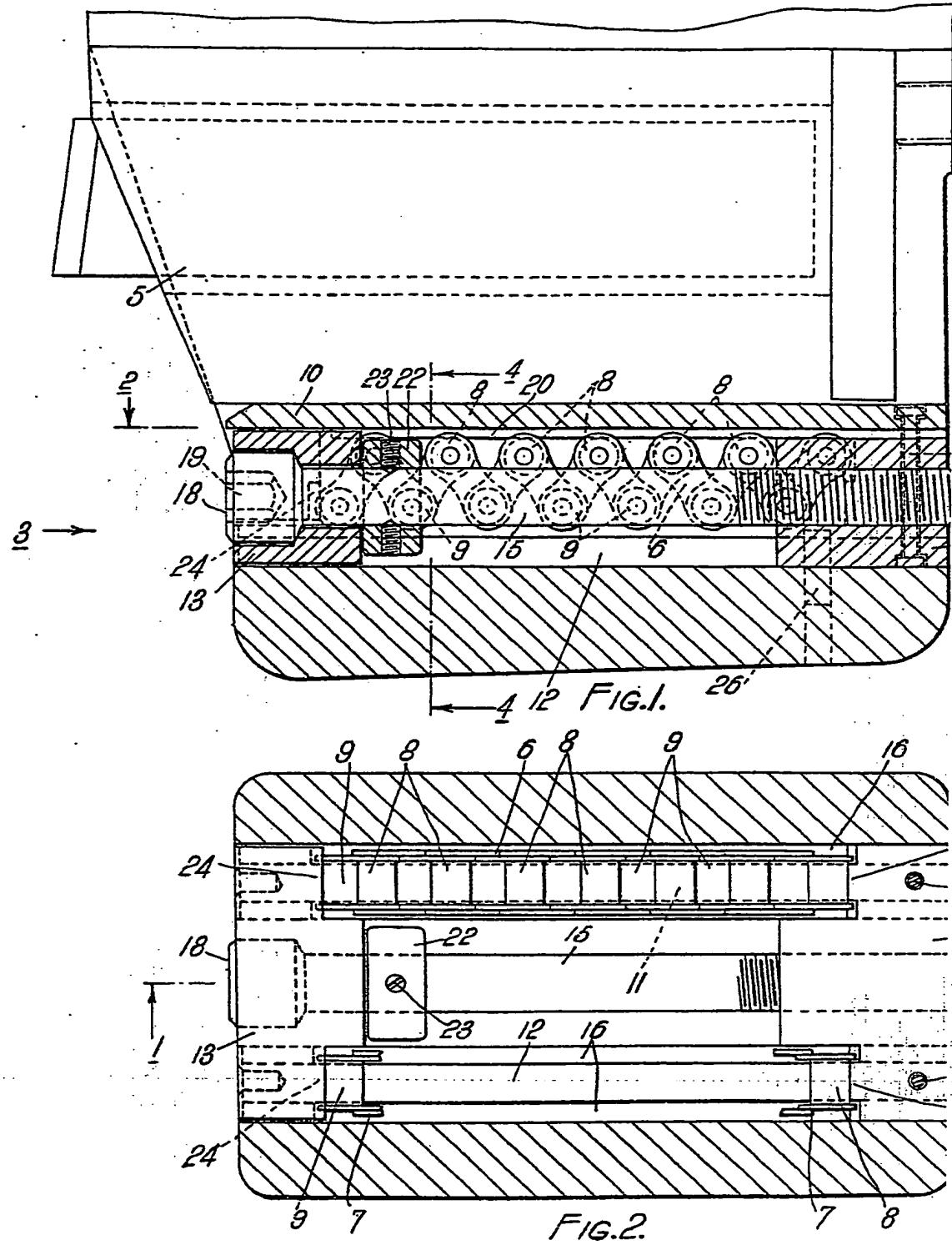
use in clamping a tool in machine tool  
holders or for like purposes, constructed  
and adapted to operate substantially as  
described with reference to the accom-  
panying drawings.

Dated this 11th day of March, 1940.  
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7, Essex Street, Strand, London, W.C.2.  
For the Applicants.

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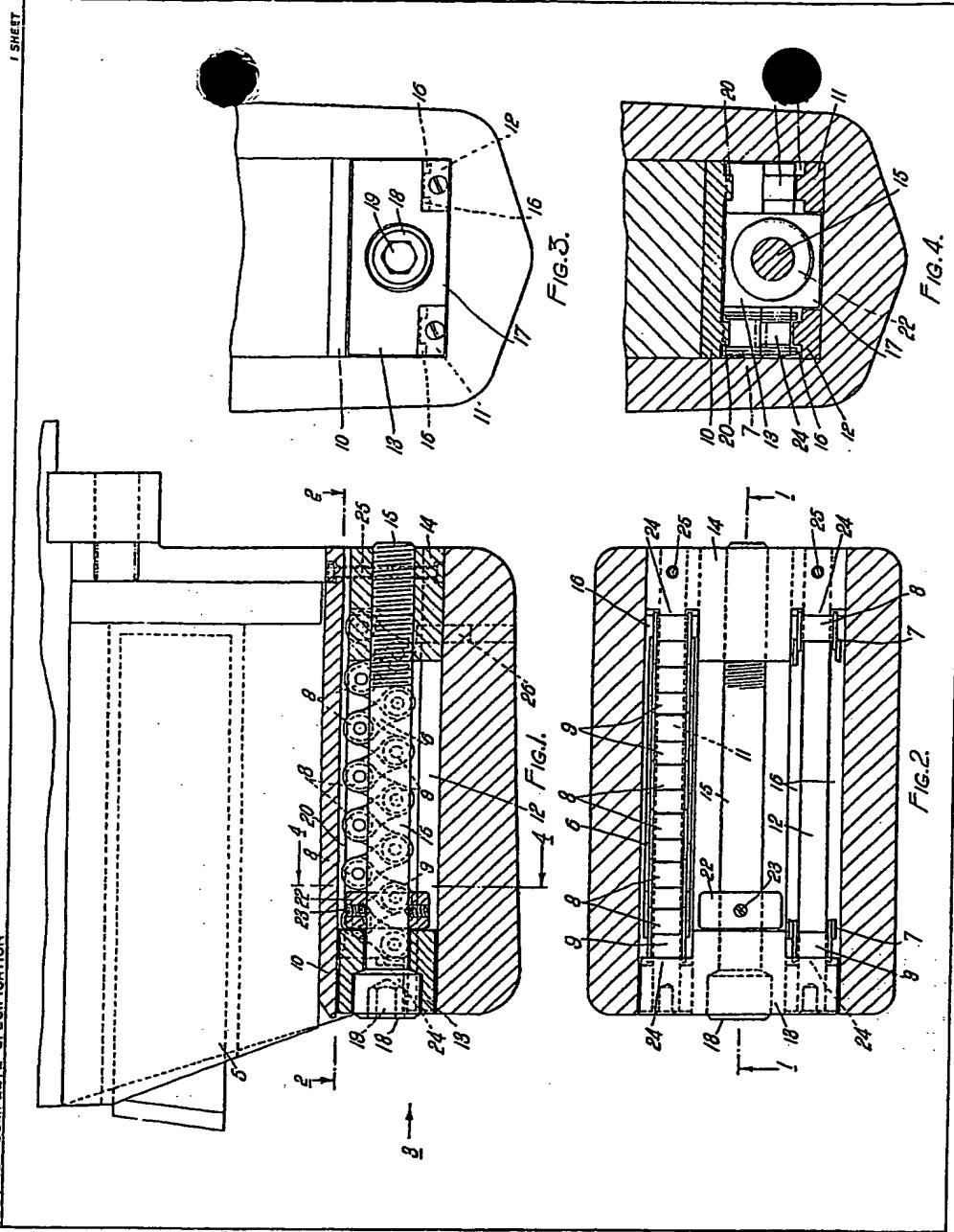
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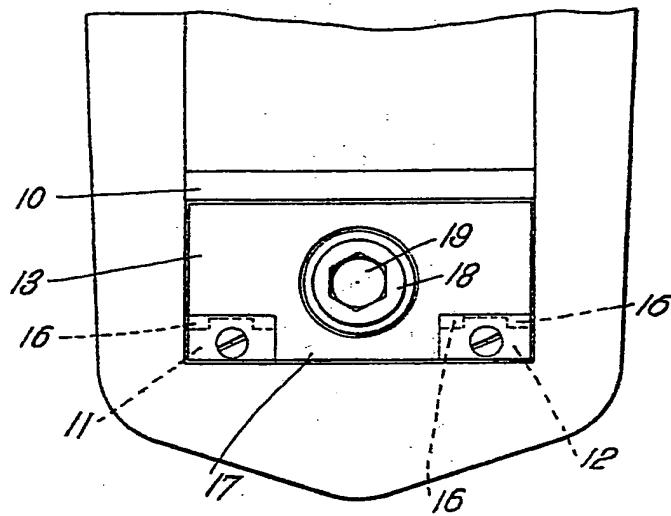
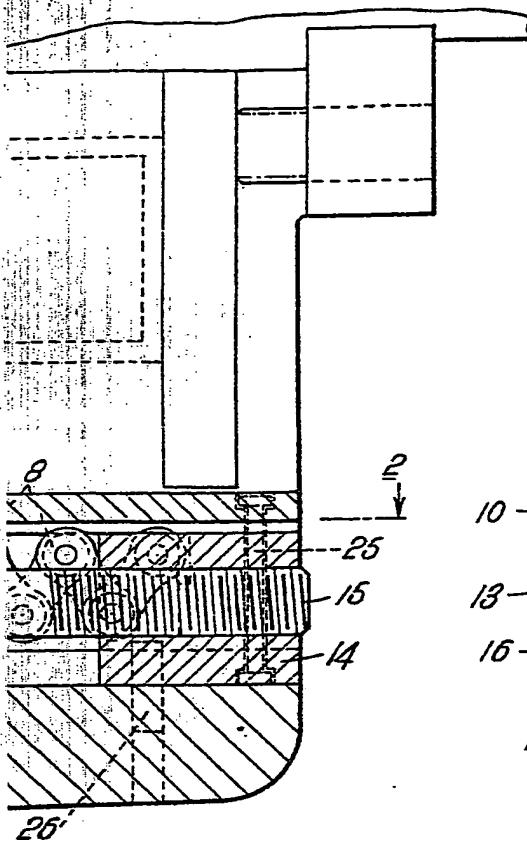


FIG. 3.

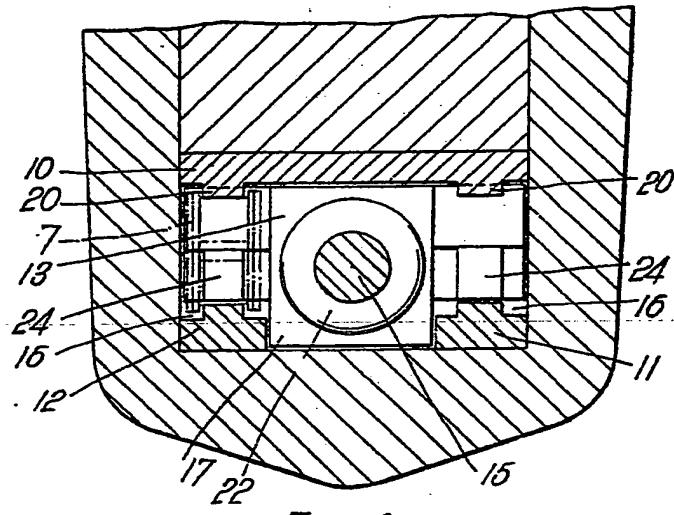
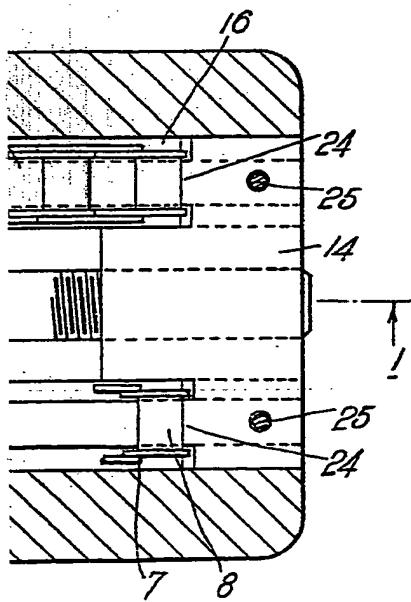


FIG. 4.